



May 9, 1962

Dr. William Otting  
Chief Scientist  
Defense Atomic Support Agency  
The Pentagon  
Washington, D. C.

Dear Dr. Otting:

In accordance with your suggestion during Mr. Harry L. Browne's conversation with you in March, I would like to confirm the interest of Hazleton-Nuclear Science Corporation in performing studies of the type previously carried out in Project 57, and to suggest the possible nature of our participation in further field tests.

It is our understanding that an interest exists in obtaining additional field-type information from which acute and chronic hazards produced by inadvertent (one point) detonation or burning of plutonium-containing weapons may be evaluated. Apparently, the stringency of present weapons-handling regulations is such that both logistic and economic penalties are imposed. Animal tests at Project 57 showed no evidence of intake of body burdens of plutonium by dogs; however, the main body of the cloud apparently did not contact these animals. Biological toxicity studies conducted since Project 57, have shown under some conditions a higher degree of retention in the lung and slower excretion rates than previously observed.

It seems evident to us that any further field work done should encompass at least the following general points:

- (1) Measurements to be made should be in support of the best current evidence of the critical parameters determining biological toxicity of plutonium.
- (2) Detonation or burning conditions should simulate typical situations to be anticipated, and the properties of the resulting dispersed plutonium should be characterized to provide a basis for realistic biological, meteorological, and other studies.
- (3) Exposure of animals should be undertaken on a scale sufficient to insure that a basis for correlation with results of laboratory studies of toxicity is established, since a single field test of this type cannot be expected

Dr. William Otting

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to provide generally applicable conclusions.

- (4) Measurements made should, as in the past, distinguish between acute and chronic exposures. However, since the latter is particularly dependent on the influence of the test environment on resuspension of deposited plutonium, an attempt should be made to obtain data which could be used for evaluation of effects in several environments.
- (5) Data collected on dispersal and deposition phenomena should include sufficient meteorological, fallout and cloud information so that the relationship between multiple detonations or fires and increased extent of the plutonium hazard could be estimated.
- (6) An actual plutonium-bearing device rather than a uranium substitute should be used for the test to insure that typical fragmentation and/or burning occurs and that representative cloud and particulate characteristics are obtained.

The above points are, of course, rather general ones. However, since we have not had an opportunity to review the extensive classified and unclassified literature on the subject, we are not in a position to make more detailed comments at this time. Such a review should naturally precede formulation of a specific proposal.

Similarly, it is not feasible for us to propose in detail the scope of our own activities in such a project, but for the purposes of this letter, I would like to indicate several possibilities for your consideration.

- (1) Provide a project officer and several key project staff members for technical coordination, planning and direction of the field project involving characterization of the contaminating event and biological effects.
- (2) Undertake collection of aerosol, fallout or other samples and provide laboratory analysis for plutonium, etc.
- (3) Expose experimental animals for determination of plutonium intake under conditions of acute or chronic exposure.
- (4) Study toxicity and biological effects of exposure of experimental animals to plutonium dispersions, includ-

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psy and histopathological examination.

specific studies relating to re-evaluation  
hazards of plutonium dispersal, for example,  
of micrometeorological conditions, and  
of environment on redispersal and chronic

ad to discuss these possibilities further at  
re.

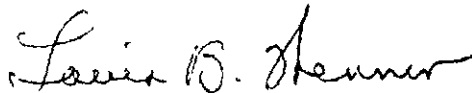
ist you in evaluating the experience and quali-  
NSC personnel, I have enclosed resumes of the  
rs of the technical staff and our consultants.  
ochure is also enclosed.

re to note that the facilities and personnel  
iate organizations, Nuclear Science and  
oration, Pittsburgh, Pa., and Hazleton  
lls Church, Virginia, are available to  
of H-NSC.

ion can be supplied on request.

on of our interest in this program is very

Sincerely yours,



Louis B. Werner  
Vice President

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ning, AEC

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## HAZLETON-NUCLEAR SCIENCE CORPORATION

### FACILITIES

#### Summary

Hazleton-Nuclear Science Corporation (H-NSC) operations are presently carried out at four principal locations and, as required, in the field. Housed at 4062 Fabian Way, Palo Alto, California, are: Laboratory Building No. 1, consisting of 13,000 sq. ft. of floor space in which are housed the analytical chemistry laboratories, radio-chemistry facilities, radiological laboratories, and the library. Executive offices of the corporation and its two divisions - Life Sciences and Nuclear Sciences also are located at this address.

Life Sciences Division presently conducts its operations at Building No. 1, and at three other facilities located nearby: Laboratory Building No. 2 consisting of 5500 sq. ft. of floor space located at 750 San Antonio Road, Palo Alto; the Research Farm located at Half Moon Bay, California; and a Primate Laboratory located in San Mateo County, Building No. 1 houses analytical chemistry, agricultural chemistry, and industrial hygiene laboratories, and an associated instrumentation room. Building No. 2 houses the Acute Toxicity and Chronic Toxicity Laboratories for studies on small animals of all kinds; the Autopsy and Clinical Pathology Laboratory; the Inhalation Laboratory,

complete with special dynamic-type inhalation chambers; and kennel facilities for about 100 dogs. The Research Farm is used for large animal studies on cattle, sheep, swine and poultry. A separate specially equipped and staffed facility is available for experimentation with primates.

Nuclear Sciences Division facilities are all presently located in Laboratory Building No. 1 with the exception of leased irradiation facilities. The H-NSC facilities include: the Radiochemistry Laboratory equipped for analysis for fission products, heavy elements, and other radionuclides; the Labeled Compounds Laboratories in which compounds are synthesized and tagged with various radionuclides; the Industrial Isotopes Laboratory which is used for preparing radioactive sources and counting standards; the Health Physics Facilities for radiation protection, internally and on a consultant or service contract basis; and the Low-Level Radioactivity Facility with laboratories devoted to low-level radioactivity measurement.

# HAZLETON-NUCLEAR SCIENCE CORPORATION

## FACILITIES

### Life Sciences Division

The Life Sciences Division of Hazleton-Nuclear Science Corporation, headquartering at 4062 Fabian Way, Palo Alto, California, maintains the following facilities:

#### Laboratory No. 1, 4062 Fabian Way, Palo Alto.

Chemistry Laboratories - These laboratories are staffed and equipped for research and development in organic analytical procedures, of which pesticide residue analysis is a typical problem. Facilities also include a Volatile Compounds Room, completely explosion proof, for handling hazardous materials, a large refrigerated room for sample storage and special cold studies, a separate instrument room and a locked chemical storage area.

Industrial Hygiene Laboratory - A separate isolated room houses this laboratory, where analyses of air samples and biological materials (urine, blood) are conducted for lead, selenium, mercury, and other environmental contaminants under industrial and government monitoring programs.

#### Laboratory No. 2, 750 San Antonio Road, Palo Alto.

Acute Toxicity Laboratory - This houses work areas for acute toxicity studies, such as oral and intraperitoneal toxicology,

**Life Sciences Division (Cont'd)**

irritation studies, eye irritation studies, and skin sensitization studies. Rats, rabbits, guinea pigs, and mice are commonly used in these studies.

**Chronic Toxicity Laboratories** - A separate area is maintained for subacute and chronic feeding studies in rats and other experimental animals. Special care is taken to isolate these animals from others to prevent disease spread. Animals are housed individually in wire cages, elevated above the droppings. Equipment is available for preparing test diets and for recording body weights and food consumption, and for observing the effects of the study procedures.

**Autopsy and Clinical Pathology Laboratory** - In connection with the animal studies, all autopsies and clinical procedures are conducted in a separate facility.

**Radioisotope Applications Laboratory** - Separate facilities are utilized for special studies such as metabolism studies of various compounds. These studies are conducted by tagging the compound with a radioactive label and following the compound via this label through the metabolic pathways. Special glass metabolism cages collect all excreta and are housed in this area as is the Tri-Carb Liquid Scintillation Counter.

**Inhalation Laboratory** - A laboratory for inhalation toxicology studies containing dynamic-type inhalation chambers, designed

Life Sciences Division (Cont'd)

to allow predetermined exposure times at constant concentrations of vapor or aerosol is available.

Kennels - Kennel housing for 100 dogs, with isolation wards and holding wards, food preparation areas and storage facilities are located at Laboratory No. 2.

The Research Farm located at Half Moon Bay, California, provides facilities for large animal studies, such as cattle, sheep, swine, and poultry.

The Primate Laboratory at San Francisco International Airport, utilizes facilities and trained personnel of Asiatic Animal Exports, Inc., for studies with monkeys and other primates.

Equipment of major importance now installed in Life Sciences Division laboratories is listed below:

- a. DK-2 Ultraviolet Recording Spectrophotometer with flamephotometer attachment
- b. P-E - Model 21 - IR Recording Spectrophotometer with 20x scale expansion
- c. Dohrmann Microcoulimetric gas chromatograph with chloride and sulfur cells
- d. Microbalance
- e. Fisher Electropode
- f. Actigraph paper strip counter for isolation of tagged metabolites in radiotracer studies in animals



**Life Sciences Division (Cont'd)**

- g. Packard Tri-Carb Liquid Scintillation Spectrometer**
- h. Spectronic 20 - BAL**
- i. Special extraction equipment:**
  - 1. Rince - liquid-liquid extractor**
  - 2. Bartsch - Stender extractor**
  - 3. Rince Vacuum extractor**
  - 4. Special chromatography columns and equipment**
- j. Proportional Counter - Nuclear Measurement Corp.**
- k. Gas chromatography apparatus**
- l. Spectrophosphorimeter with fluorometric attachment**
- m. Electrochromatography apparatus**
- n. Roth metabolism equipment.**

**Additional information on H-KSC's facilities and equipment, including photographs, is contained in the company brochure.**

# HAZLETON-NUCLEAR SCIENCE CORPORATION

## FACILITIES

### Nuclear Sciences Division

The Nuclear Sciences Division of Hazleton-Nuclear Science Corporation maintains the following facilities at 4062 Fabian Way, Palo Alto, California.

Radiochemistry Laboratory - This laboratory is outfitted with the instruments and apparatus of a general chemistry laboratory but with considerable additional equipment for analytical radioactivity applications, including: activation analyses, isotope dilution, and radiometric analysis. It is provided with the materials and apparatus for handling many applications of tracer techniques, including ion exchange, solvent extraction, chemical kinetics, reaction mechanisms, solubility, vapor pressure, transport phenomena such as diffusion and migration, erosion, and corrosion. An associated counting room contains alpha gas flow and scintillation detectors, beta counters, and single and multichannel gamma spectrometers.

Low-Level Radioactivity Facility - This includes two radiochemistry laboratories, a sample preparation laboratory, and a low-level radioactivity counting room containing low-level counters for determining alpha, beta, and gamma activities in all types of low-level radioactive samples, including soils, bone, milk, plants, and water specimens.

Nuclear Sciences Division (Cont.)

Labeled Compounds Laboratory - The main laboratory is equipped for synthesis of a wide variety of tagged compounds. Compounds are labeled with radionuclides such as  $C^{14}$  and  $P^{32}$  or with inactive isotopes such as  $H^3$ . A separate laboratory is equipped with gas handling apparatus for synthesis of  $H^3$ -labeled compounds.

Industrial Isotopes Laboratory - Facilities for the preparation of long-lived standards and fabrication of tools and components labeled radioactive isotopes are available in this lab.

Radiation Physics - Facilities are maintained for internal and outside contract programs in radiation protection (health physics). Approximately twelve standard survey instruments for monitoring of alpha, beta, and gamma radiation are available as well as high and low volume air samplers and other equipment for radiation protection, control, and decontamination of radioactive materials. Facilities and capabilities are also available for environmental radiation survey, control of radioactive waste, and similar sampling projects.

Access to other unique facilities at the University of California are available. The G. L. Tiesler reactor where neutron irradiation to flux up to  $10^{14}$  neutrons/cm<sup>2</sup> are maintained. Other reaction and particle accelerators located in nearby California and Berkeley are used.

**Nuclear Sciences Division (Cont'd)**

**Major items of equipment now installed in the Nuclear Sciences Division laboratories are listed below:**

- a. RIDL 400-channel Pulse Height Analyzer with 3"x3" NaI crystal
- b. 4 Sharp Low Background Anti-Coincidence Beta Counters (Bgr 0.2 counts/min)
- c. Nuclear-Chicago Single Channel Gamma-Ray Spectrometer
- d. Eberline Low Level Alpha Scintillation Counter (bgr 2 counts/hour)
- e. NSC Internal Proportional Counter
- f. Packard Tri-Carb Liquid Scintillation Counter
- g. Gamma Scintillation Counter
- h. Nuclear-Chicago Chromatogram Scanner.

LOUIS B. WERNER

Vice President

#### SUMMARY

Dr. Werner is an internationally known radiochemist who has had over fifteen years of academic, government laboratory, and diplomatic-scientific experience. His early accomplishments include work on the separation of the first reactor-produced plutonium and isolation of the first pure sample of curium. His late work included the investigation of radioactive contaminant effect on various materials and the investigation of other radiological effects of atomic weapons. Before joining Hazleton-Nuclear Science Corporation, where he directs the program in nuclear energy, he served as the U.S. Atomic Energy Commission's (AEC) representative for the United Kingdom and Ireland.

#### EDUCATION

B.S.	College of Idaho	Chemistry
Ph.D.	University of California	Radiochemistry

#### EXPERIENCE

Scientific Representative, U.S. Atomic Energy Commission, U. S. Embassy, London, England, two years. Duties involved representing the AEC in the United Kingdom and Ireland for the purpose of encouraging, developing, or implementing mutual co-operation in the peaceful use of atomic energy and representing the AEC on other matters appropriate to its program and mission.

Associate Head, Chemical Technology Division, U.S. Naval Radiological Defense Laboratory, San Francisco, California, two years. Duties involved administration of the Division's technical program in Atomic Weapons Tests. A typical field-program budget amounted to one to two million dollars, for a one to one and a half year program, and involved approximately 75 to 100 scientists, engineers and technicians during the peak periods. The program had to do primarily with investigation of radiological effects of atomic weapons (radiation and fallout)

Louis B. Werner

EXPERIENCE (Continued)

and their impact on military objectives.

Head of Fallout Program, U.S. Naval Radiological Defense Laboratory (USNRDL), nine months. Program investigated nature of fallout and fallout event, developed methods for prediction of fallout from nuclear weapon detonations.

Head of Contamination-Decontamination Program, USNRDL, four and one-half years. Program investigated interaction between surfaces of materials and radioactive contaminants, solid and liquid; developed decontamination agents and procedures.

Surface chemistry and heavy element research, USNRDL, two and one-half years.

Research Assistant, Radiation Laboratory, University of California at Berkeley (coincident with graduate school studies), three years. Investigated chemistry of the new elements americium and curium under Prof. Glenn T. Seaborg and Prof. I. Perlman. Discovered the americium V oxidation state; isolated the first pure sample of curium. The latter work comprised his Ph.D thesis.

Research Assistant, Manhattan District Atomic Energy Project, three and one-half years. Worked at Oak Ridge, Tenn., Richland, Wash., and the University of Chicago. At University of Chicago, with Dr. B. B. Cunningham, isolated the first pure sample of the new element, plutonium. Other work involved separation of the first reactor-produced plutonium at Oak Ridge and studies of the chemical properties of plutonium using minute (microgram) quantities of the element then available.

PROFESSIONAL ACTIVITIES

Sigma Xi

Louis B. Werner

PUBLICATIONS

"The First Isolation of Plutonium"  
Cunningham, B. B. and Werner, L. B.  
Journal of the American Chemical Society 71, 1521 (1949)

"The Pentavalent State of Americium"  
Werner, L. B. and Perlman, I.  
Journal of the American Chemical Society 73, 495 (1951)

"The First Isolation of Curium"  
Werner, L. B. and Perlman, I.  
Journal of the American Chemical Society 73, 5215-17 (1951)

"Estimates of Heavy Isotopes Formed in Atomic  
Processes"  
Werner, L. B.  
U.S. Naval Radiological Defense Laboratory Report, July 1959

"Chemical, Physical and Radiochemical Characteristics  
of Fallout at a Pacific Field Operation"  
Werner, L. B. and Tompkins, E. R.  
Weapons Test Report, September 1955

"Percentage of Weapon Debris Removed by Local Fallout"  
Werner, L. B.  
U.S. Naval Radiological Defense Laboratory Report (1956)

"Summary of the Atomic Energy Program of the United  
Kingdom"  
Atomic Energy Commission, London, March 1960

RALPH W. FOGLEMAN

Vice President

SUMMARY

Dr. Fogleman was formerly Manager, Western Division, Hazleton Laboratories, Inc. from 1957 to 1960. Prior to that time he was Head of the Agricultural Chemicals Department in Hazleton Laboratories' Falls Church, Virginia Division from 1954 to 1957, and Head of the Experimental Farm from 1953 to 1954. He was, as a toxicologist, assigned to the U.S. Army Veterinary Corps, Gassing Branch, Chemical Corps Medical Laboratories, Army Chemical Center, Maryland, from 1950 to 1953. Before 1953 he practiced Veterinary Medicine in Omaha, Nebraska and Dallas, Texas.

EDUCATION

D.V.M. - Kansas State University

Advanced Courses - Physiology and Biochemistry  
University of Maryland

EXPERIENCE

Toxicology of pesticides and food additives. Evaluation of limits of safety of chemicals in agriculture and industry. Consultant to industry on problems of industrial hygiene and toxicology.

PROFESSIONAL  
ACTIVITIES

American Veterinary Medical Association  
American College of Veterinary Toxicologists (Councilor)  
U.S. Livestock Sanitary Association  
Animal Care Panel  
New York Academy of Science  
American Chemical Society - Agriculture & Food Division  
American Industrial Hygiene Association  
Northern California Branch



R. W. Fogleman

PUBLICATIONS

Fogleman, R. W., et al., The Respiratory Effects of Inhaled Toxic Vapors Dispersed in Air: I. An Apparatus for Quantitative Measurements of Inspiratory and Expiratory Air, Chemical Corps Medical Laboratories Research Report No. 179, Army Chemical Center, Maryland, April, 1953.

Fogleman, R. W., et al., The Respiratory Effects of Inhaled Toxic Vapors Dispersed in Air: II. The Subacute Effects on Dogs of Low Inhaled Dosages of GB Administered by the Dosimetric Technique, Chemical Corps Medical Laboratories Research Report No. 287, Army Chemical Center, Maryland, June, 1954.

Fogleman, R. W., et al., Army Chemical Center, Maryland, Acute Narcotic Effects of Monochloromonomethane, "Arch. Inc. Hyg. Occupational Med." 7, 526-8, 1954.

Fogleman, R. W., Analytical Methods for Pesticides, Plant Growth and Food Additives, Chapter XIV, Toxicological Testing Methods. (In press)

Contributor to the publication, "Residue Reviews", and member of the Editorial Board.

PAUL KRUGER

Nuclear Projects Department, Manager

#### SUMMARY

Dr. Kruger has ten years of research experience in nuclear technology starting with his work at MIT in 1949. Under Dr. Kruger's supervision of the Department of Chemistry of NSEC in Pittsburgh, Pennsylvania, research and development programs have been developed for radiochemistry, reactor technology, and the industrial utilization of radioisotopes.

#### EDUCATION

B. S.	Mass. Institute of Technology	Chemistry
Ph.D.	University of Chicago	Nuclear Chemistry

#### EXPERIENCE

Dr. Kruger assisted in setting up the radioisotope research and development programs to be carried out in the new isotope laboratory of the General Motors Technical Center. While at General Motors he participated in studies on nuclear magnetic resonance and X-ray fluorescence analysis.

Dr. Kruger, as Manager of the Department of Chemistry at NSEC, was responsible for the development of the programs within the department, which presently cover three broad areas of nuclear technology: (1) Low-level radioactivity measurements, (2) Radiochemistry, and (3) Industrial uses of radioisotopes. The first area includes service programs for fallout analysis and site-survey analysis, and research and development programs on large-scale tracer experiments. The second area includes service programs on routine measurements of radioactivity burnup determinations, dosimetry, activation analysis, and the diffusion of cyclotron-produced, carrier-free radioisotopes. Many research and development programs for reactor development have been performed. The third area includes research and development, pilot-plant, and production problems of industry for which programs involving radioactivity measurements can be devised.

Paul Kruger

PROFESSIONAL ACTIVITIES

Member of American Nuclear Society  
American Chemical Society - Nuclear Engineering Division

Paul Kruger

PUBLICATIONS

"Cyclotron-Produced Carrier-Free Radioisotopes"

P. Kruger and I. J. Gruverman

J. Applied Radiation and Isotopes, 5, 21-31 (1959)

"Application of Radioactive Tracers to Oil Production"

P. Kruger

45th annual meeting of Compressed Gas Association, Inc.,  
New York, January 1958

"Specification Survey for Radiocarbon Dating"

P. Kruger

American Antiquity, 23, 2, (1957)

"Radiochemistry Solves Problems in Reactor Technology"

P. Kruger

Industrial Science and Engineering, November 1958

"Industrial Tracing with Radioisotopes"

P. Kruger

Symposium on Industrial Utilization of Radioisotopes,  
Baltimore, April 1958

"Low-Level Neutron Dosimetry with Sensitive Foil Methods"

P. Kruger

Nucleonics, 17, No. 6, 116 (1958)

"Determination of Sr<sup>90</sup> Activity in Waters with Ion-Exchange  
Concentration"

C. W. Stanley and P. Kruger

Nucleonics, 14, No. 11, 114 (1956)

"Radiochemical Study of the Separation of Lanthanum from  
Barium by Cation Exchanger; Genetic Study of Ba<sup>140</sup> and  
a La<sup>140</sup> Reservoir"

P. Kruger and C. D. Coryell

J. Chemical Education, 32, 280 (1955)

"Evidence for 25.5-day Sr-76-sec Rb Chain"

P. Kruger and N. Sugarman

Physical Review, 90, 158 (1953)

"The Measurement of the Stability of a Complex Ion With  
Radiotracers and Ion Exchange Resins"

P. Kruger and J. Schubert

J. Chemical Education, 30, 196 (1953)

Paul Kruger

PUBLICATIONS (Continued)

"Identification of 2.0-hr Nd<sup>149</sup> and Search for Nd<sup>151</sup>"  
P. Kruger and C. D. Coryell  
Mass. Inst. of Tech. L.N.S.E. Progress Report,  
pp. 77-83, July 1950

"Rapid Rare Earth Separations"  
P. Kruger, J. A. Marinsky, and C. D. Coryell  
Mass. Inst. of Tech. L.N.S.E. Progress Report,  
pp. 57-58, July 1950

ROBERT H. KING

Chemistry Department

SUMMARY

Dr. King is a biochemist with fourteen years post-doctoral experience in the field. He has taught and directed research in nutritional biochemistry at the University of South Dakota Medical School, and later was in charge of agricultural research chemistry at the University of Wyoming. Before joining H-NSC he served as project leader in bioassay test technology and as chemical division project co-ordinator at the U. S. Army Proving Ground at Dugway, Utah.

Dr. King is now head of the Biochemistry Section at H-NSC and has responsibility for biochemistry activities of H-NSC and its clients.

EDUCATION

B.A.	University of British Columbia	Chemistry
B.S.A.	University of British Columbia	Biology
M.S.	McGill University	Animal Nutrition
Ph.D.	Purdue University	Biochemistry

EXPERIENCE

Project Leader, Bioassay Test Technology, Dugway Proving Ground, two years. This work involved development of assay procedures for field application in support of the field test program "Operations in Chemically Contaminated Areas," and included acute animal toxicity, enzyme inhibition, and decontamination studies.

Project Coordinator, Chemical Division, Dugway Proving Ground, two years. Staff duty in the office of the Division Chief was concerned with preparation and review of field test technology reports on sampling and analysis procedures; dissemination, decontamination and protection systems; and biological effects of toxic chemical agents.

Head, Agricultural Research Chemistry Department, University of Wyoming, three years. Direction of applied research on chemistry of wool, poisonous plants, insecticides,

ROBERT H. KING (Cont'd)

herbicides, food and feed production and preservation; basic research on nutrient factors affecting animal fat metabolism.

Assistant Professor of Biochemistry, University of South Dakota, seven years. This experience included teaching and research in nutritional biochemistry in medical, graduate and undergraduate programs; advanced courses in vitamins and hormones; direction of Master's theses; medical technology counselling; and co-operation with medical-hospital personnel.

PROFESSIONAL ACTIVITIES

Fellow,	American Institute of Chemists (national committee on new chapters and expansion)
Fellow,	American Association for the Advancement of Science
Member,	American Public Health Association (councillor on foods and nutrition, western branch)
Member,	American Chemical Society
Member,	New York Academy of Sciences
Member,	Society of the Sigma Xi

ROBERT H. KING

PUBLICATIONS

Oxidation-reduction potentials of lactic acid bacterial cultures, B.S.A. thesis, U. Brit.Col. 1939, Directed by Blythe A. Eagles.

Relative ability of sheep, rabbits, and guinea pigs to digest pasture herbage feed fractions, M.Sc.thesis, McGill Univ., 1940, directed by E. W. Crampton.

Concentration of the unidentified growth factor in condensed fish solubles, Ph.D. thesis, Purdue Univ. 1948, direct by S. M. Hauge (Dec. 1956), published in Archives of Biochemistry 24, 330 (1949).

Animal protein factor in condensed fish solubles, Proceedings South Dakota Academy of Sciences 28, 59 (1949).

Choline deficiency in the weanling albino rat, Proceedings South Dakota Academy of Sciences 29, 97 (1950).

Choline and vitamin B-12 in nutrition of the weanling albino rat, with N. D. Korbitz, Proceedings South Dakota Academy of Sciences 30, 122 (1951), presented American Chemical Society, Milwaukee, April 1952.

Isolation and characterization of human urinary porphyrins, with J. W. Holleman, and E. H. Shaw, Proceedings South Dakota Academy of Sciences 30, 137 (1951).

Congenital alopecia in the albino rat, with G. H. Stidworthy, Proceedings South Dakota Academy of Sciences 30, 140 (1951).

Thyroid effects on vitamin metabolism in the rat, with G. H. Stidworthy, Proceedings South Dakota Academy of Sciences 31, 248 (1952).

Potentiation of fatality in the choline-deficient rat, with R. S. Jernstrom, Proceedings South Dakota Academy of Sciences 32, 179 (1953).

Nutrition and physical activity in the albino rat - preliminary study of controlled thiamin deficiency, with M. Grodsky, Proceedings South Dakota Academy of Sciences 33, 187 (1954).



GEORGE D. MEYDING

Toxicology-Pharmacology Department

SUMMARY

Mr. Meyding is a biologist in the Toxicology-Pharmacology Department at Hazleton-Nuclear Science Corporation. He was formerly a biologist and pharmacologist at Hazleton Laboratories in Falls Church, Virginia.

EDUCATION

B. S. - Georgetown University

Graduate studies in gross and microscopic anatomy, Physiology and Biochemistry - Georgetown University Graduate School and School of Medicine.

M. A. - San Jose State College - In progress

EXPERIENCE

Conducted pharmacological studies and toxicological studies on a wide variety of chemicals used as pesticides, drugs, and food additives. Conducted research in cancer chemotherapy, electrophysiology, and active transport systems.

PROFESSIONAL ACTIVITIES

American Industrial Hygiene Association  
Northern California Branch  
Animal Care Panel  
Biometrics Society

WILLIAM LEE

Nuclear Systems Research and Development

SUMMARY

Mr. Lee is nationally recognized as an authority in the highly specialized area of nuclear detection and measurement systems. Prior to joining H-NSC, he was in charge of the Radiation Physics Department for the firm of Edgerton, Germeshausen and Grier at their Santa Barbara, California facility. There he was responsible for establishing and directing an outstanding program of research and development in nuclear detection systems and methods.

Mr. Lee is unusually well-equipped by his experience to appreciate the specialized instrumentation needs in both areas of science served by H-NSC since he was himself for many years strictly a "user." As a research investigator, Mr. Lee made many significant contributions to the fields of radiochemistry, radiobiology, biochemistry, food technology and agricultural and industrial chemistry.

As a specialist in nuclear instrumentation development, he has effected many valuable advancements in the state-of-the-art.

EDUCATION

B. A.	University of California Berkeley, California	Chemistry
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EXPERIENCE

Head, Radiation Physics Dept., Edgerton, Germeshausen and Grier, Inc., Santa Barbara, California 1/60-1/62. In charge of research and development programs in nuclear detectors, fluors and scintillators, experimental nuclear measurement systems. Responsible for many significant new developments including:

1. Extended range rate-meter circuit using dead-time gating principles.
2. A radiation time-of-arrival fallout or nuclear accident meter.
3. Systems for generating extremely short light or electrical pulses for timing or measuring purposes.

William Lee

PUBLICATIONS

"Alterations in Metabolism of C-14 Labeled Glycine Following Severe Burn Injury," Fed. Proc. 13, p. 249 (1954)

"Phospholipid Changes in Rat Skin After Exposure to Radiant Thermal Injury," Archives of Biochem. and Biophysics 54, p. 146-53 (1955)

"The Combined Effects of Thermal Burns and Whole Body X-irradiation," Annals of Surgery 142, p. 66-75 (1955), Co-author

"Direct Estimation of Gamma-ray Abundances in Radio-nuclide Mixtures. Complement Subtraction Method," Analytical Chemistry 31, p. 800-06 (1959)

"Xenon Scintillator as a Gamma Insensitive Neutron Detector," EG&G Report #TN-8A (March 1961)

"The EG&G Fluor Decay Time System," EG&G Report #TN-11 (July 1961)

"Phase I Preliminary Report - Tritium Monitoring System," EG&G Report #S-60 (Oct. 1961)

ELMER R. SMITH

Senior Radiochemist

SUMMARY

Mr. Smith is an experienced radiochemist with studies in a variety of fields, including fission product and corrosion product analysis, activation analysis of biological material, decontamination studies, tracer studies, application of radioisotopes to industrial problems. Mr. Smith has been an Instructor in Biophysics at a major medical college. He is presently Supervisor of Hazleton-Nuclear Science Corporation's radiochemistry programs.

EDUCATION

B.S. - University of Wisconsin - Chemical Engineering

Four years of graduate work in Biophysics at the University of California

EXPERIENCE

Senior Scientist in Radiochemistry, Bettis Atomic Power Laboratory, Westinghouse Electric Corporation. Group Leader of Chemistry Section of MTR-ETR Site Irradiations Group, 1957-1961. Duties included analytical and radiochemical analyses on in-pile fuel and non-fuel experiments; circulating volume determinations, leak detection using radioisotopes; design of radiation monitoring systems; effects of gamma rays on chemical poisons for reactors; activation analyses; and recoil range studies, as well as preparation of procedures for chemical decontamination.

Applications Engineer, Beva Laboratory, 1957. This position encompassed the use of radioisotopes in industry, design of new nuclear measurement instruments and sales engineering.

Research Assistant, Sloan Kettering Institute for Cancer Research, 1954-56. Position held was Group Leader in the determination of tracing metals in humans by neutron activation and wet chemical analysis together with a guest appointment in Biology Division at Brookhaven National Laboratory. Other activities included Instructor in Biophysics at the SKI Division of Cornell Medical College.

Elmer R. Smith

EXPERIENCE (Continued)

Research Assistant in Biophysics, Lawrence Radiation Laboratory, 1951-54. Duties consisted of neutron, proton, and alpha activation analyses projects, development of ion-exchange separation procedures and tracer studies.

Biochemist, Los Alamos Scientific Laboratory, 1947-49.

PROFESSIONAL ACTIVITIES

American Chemical Society  
Sigma Xi.

Elmer Robert Smith

PUBLICATIONS

"Recoil Range of Fission Products in Zirconium." WAPD-TM-198  
Authored by E. R. Smith and P. W. Frank, November 1959

"Analysis of Trace Elements in Human Tissues,  
II the Lymphomatous Diseases." CANCER 10, 151-160. Authored  
by H. J. Koch, E. R. Smith and J. Mc Neely, 1957

"Analysis of Trace Elements in Human Tissues,  
I Normal Tissue." CANCER 9, 499-511. Authored by H. J. Koch,  
E. R. Smith, N. F. Shimp and J. Connor. 1956

"The Determination of Copper and Zinc in Normal and Pathologic  
Human Thyroid Tissue." Presented at annual meeting of American  
Goiter Society, Oklahoma City. Journal of Clinical Endocrin-  
ology and Metabolism 16, 123-219. Authored by H. J. Koch and  
E. R. Smith. 1956

"Methods and Results of Spectrographic Analysis of Human Blood  
and Tissue." Presented at the Pittsburgh Conference on  
Analytic Chemistry and Applied Spectroscopy, Pittsburgh Pennsy-  
vania. Authored by N. F. Shimp, J. Connor, A. L. Prince, F. E.  
Bear, H. J. Koch and E. R. Smith. March 4, 1955

"Copper Metabolism in Normal Long Evans Rats." U.C.R.L. 3520  
Authored by J. K. Ashikawa, E. R. Smith and H. L. Helwig. Sept  
1956

"Separation of Fe, Co, Zn and P on Synthetic Resin." U.C.R.L.  
2655. Authored by H. L. Helwig, J. K. Ashikawa and E. R. Smith  
1954

"Separation of Fe and Co on Synthetic Resin." U.C.R.L. 2296.  
Authored by H. L. Helwig, J. K. Ashikawa, H. Clokie and E. R.  
Smith. 1953

DONALD C. LAWRENCE

Nuclear Products Department

SUMMARY

Mr. Lawrence is a health-physicist with five years of graduate study and experience in the field commencing with his work as an AEC Radiological Physics Fellow. As a research engineer at Atomics International, Mr. Lawrence organized and directed various research programs in reactor technology and radiation physics. Before joining H-NSC he did further graduate study, research and teaching in the field of medical physics.

Mr. Lawrence is now head of the Health Physics Section at H-NSC and has responsibility for health physics activities of H-NSC and its clients.

EDUCATION

B.S.	University of Washington	Physics
M.S.	University of Washington	Nuclear
		Engineering
	UCLA Medical Center	Medical Physics

EXPERIENCE

U.S.P.H.S. Ph.D Fellow in Medical Physics, UCLA Medical Center, one year. In connection with this program, he worked as Radiation Physicist at Harbor General Hospital, Los Angeles, where he provided radiological physics support for the radiation therapy and radioisotopes clinics, and taught elements of nuclear physics to resident radiologists.

Responsible Engineer, Radiation Measurements Unit, Atomics International, two and one-half years. He held prime responsibility for organizing and directing studies in reactor technology. Additional experience included hazards evaluations on Project Rover, development of flux monitoring systems and a solid state radiation dosimeter. He also provided assistance to the Health Physics Division by designing and using specialized radiation detection systems, and providing training for health physics personnel in areas of radiation measurements and radiological safety.

AEC Health Physics Fellow, University of Washington, eighteen months. Work as an AEC Fellow included research in fast neutron dosimetry, shielding design, and development of calibration facilities in addition to training in practical health physics at the Hanford Laboratories.

DONALD C. LAWRENCE (Cont'd)

PROFESSIONAL ACTIVITIES

Health Physics Society, Board of Directors, Southern  
California Chapter, Chairman, Education Committee  
Tau Beta Pi - National Engineering Honorary  
Alpha Epsilon Delta - Pre-medical Honorary



Donald C. Lawrence

PUBLICATIONS

"Fast Neutron Dosimetry of Pu-Be Neutron Source"  
M. S. thesis 1958

"Preliminary Investigation of the Radiation Environment of  
the Proposed KIWI-B Test Site," NAA-SR 3210, 1958 (Coauthor)

"Fabrication of Thick Beta Sources," Health Physics 2 217 (1958)

"Mixed Radiation Dosimetry of a Plutonium-Beryllium Neutron  
Source," Health Physics 2 95 (1959)

"Conductivity Changes in Insulating Materials as a Mechanism  
of Radiation Dosimetry," Health Physics, 4 189 (1960)

"Radioisotopes in the OMRE," NAA-SR memo 1958

"First Summary Report on the Radioisotopic Investigation of  
OMRE Coolant," NAA-TDR 4594 (1959)

Plus other internal Atomics International publications of  
similar nature

GERALD H. HAMADA

Nuclear Projects Department

SUMMARY

Mr. Hamada's present activity at H-NSC is carrying out programs involving low-level counting and performing other analyses in the radio-chemical field.

EDUCATION

B.A.	University of Hawaii	Chemistry
	New York University Graduate School	-
	Advanced Courses in Chemistry	

EXPERIENCE

Five years with the United States Atomic Energy Commission's Health and Safety Laboratory as a radiochemist, doing method development and research in the specialized field of low-level counting. Prior experience included materials testing work for the Corps of Engineers.

## ISADORE PERLMAN

### Consultant

#### SUMMARY

Dr. Perlman is a world-renowned scientist whose research has involved radioactivity applied with unique versatility to greatly diverse fields. He was a pioneer in the application of radioactive tracer techniques to physiological problems, and his knowledge of radiochemistry was utilized extensively during the Manhattan Project. In 1947 he and Dr. Louis B. Werner were the first to chemically isolate the element curium. In more recent years he has been the discoverer of numerous isotopes. Dr. Perlman's many awards and honors include receipt of the E. O. Lawrence Award in 1960. At the present time, Dr. Perlman provides guidance and assistance to Hazleton-Nuclear Science Corporation as a Director and as a Consultant.

#### EDUCATION

B.S.	University of California	Chemistry, 1936
Ph.D.	University of California	Physiology, 1940

#### EXPERIENCE

Control Chemist, Paraffin Co., Inc., Emeryville, California, 1936-37

Upjohn Research Fellow, University of California, 1940-41

##### Manhattan Project:

Chemist, National Defense Research Committee project, Berkeley, 1942

Research Associate, Metallurgical Laboratory, University of Chicago, 1942-43

Senior Chemist, Clinton Laboratories, Oak Ridge, Tennessee, 1943-44

Senior Chemist, Hanford Engineering Works, Richland, Washington, 1944-45

Research Associate, University of Chicago, 1945

Associate Professor, Chemistry, Radiation Laboratory and Department of Chemistry, University of California, 1945-49

Professor, Chemistry, University of California, 1949

Isadore Perlman

EXPERIENCE (Continued)

Chairman, Department of Chemistry, University of  
California, 1957-58  
Associate Director, Ernest O. Lawrence Radiation  
Laboratory, University of California, 1958  
Director, Nuclear Chemistry Division, Lawrence  
Radiation Laboratory, University of California,  
1958

PROFESSIONAL ACTIVITIES

American Chemical Society  
American Physical Society  
American Association for the Advancement of Science  
Sigma Xi  
Phi Beta Kappa  
Oak Ridge National Laboratory Advisory Committee for  
Chemical Toxicology

AWARDS

California Section Award of the American Chemical  
Society, 1952  
Guggenheim Fellow, 1955-56  
Ernest O. Lawrence Award, 1960

ALDO N. CORBASCIO

Consultant (Pharmacology)

#### SUMMARY

Dr. Corbascio is Assistant Research Pharmacologist in the Radiological Laboratory at the University of California Medical Center, San Francisco.

#### EDUCATION

Humanis Litteris Baccalaureus 1946 - Lycee Q. Horatius Flaccus, Bari, Italy.

M.D. 1953 - University of Bari - Medical School

D.Sc. Pharmacology 1958 - University of Pennsylvania, Graduate School of Medicine, Philadelphia, Pennsylvania.

#### EXPERIENCE

1948-50 Graduate Student in the Department of Pharmacology, University of Bari, Italy, with Professor V. Erspamer.

1950-52 Clinical Assistant - Medical Clinic Hospital of the University of Bari, with Professor V. Chini.

1954-55 Fulbright Scholar - University of Pennsylvania Hospital, with Dr. I. Starr.

1956-59 Instructor in Pharmacology - Department of Pharmacology, University of Pennsylvania Medical School, Philadelphia, with Dr. Carl F. Schmidt and Dr. George B. Koelle.

#### PROFESSIONAL ACTIVITIES

Ballistocardiographic Research Society  
Philadelphia Physiological Society  
Western Pharmacological Society

ALDO N. CORBASCIO

Consultant (Pharmacology)

PUBLICATIONS

Ballistocardiography in collaboration with I. Starr.  
World Encyclopedia of Cardiology. Chicago.

The action of Nitrates on the BCG of Patients with  
Coronary Artery Disease. Circulation, Vol. XII-4,  
Sept. 1955, with I. Starr and E. K. Pedersen.

The action of Sympathomimetic Amines on Pulmonary  
Circulation, with D. Aviado and B. Estrada.  
Fed. Proc. March 1957.

The Action of Dextran on Connective Tissue Mast-Cells  
and Kidney Juxta-glomerular Cells.  
Fed. Proc. March 1958.

The Effects of Coronary Artery Embolization on the  
Dog BCG.  
Fed. Proc. March 1959.

Effects of Intracoronary Injections of Drugs on the  
BCG, with J. W. West. Fed. Proc. March 1959

The Effects of Intracoronary Injections of Nicotine  
on the Dog BCG, in collaboration with J. W. West.  
Fed. Proc. March 1960.

Actions of Long Chain Polymers on Kidney Juxta-  
Glomerular Cells and Connective Tissue Mast-Cells.  
Circulation Res. 8, 2, March 1960

Nicotine and Smoking on the Dog Ballistocardiogram.  
Annals of New York Acad. Sciences, Vol. 90, Sept. 27,  
1960.

Actions of Leptodactyline on the Isolated Vagus-  
Auricle Preparation of the Guinea-Pig in collabora-  
tion with Kurt Greeff.  
First Int. Pharmacological Meeting, Stockholm,  
Aug. 1961.

Effects of Selective Myocardial Stimulation or  
Depression Induced by Intracoronary Administration  
of Drugs or by Obstruction of Major Vessels. Studies  
with the Dog Ultra Low Frequency Ballistocardiogram.  
Am. Heart Journal, Dec. 1961.

CHARLES E. DUISENBERG

Consultant (Radiologist)

#### SUMMARY

Dr. Duisenberg is a practicing radiologist, licensed to practice medicine in the State of California, and is certified in radiology by the American Board of Radiology.

#### EDUCATION

A.B. Stanford University 1940

M.D. Stanford University 1944

#### EXPERIENCE

San Francisco County Hospital internship 1943.

Laguna Honda Hospital, San Francisco 1944.

U. S. Army. Medical Corp, orthopedic and general surgery 1944-1946.

Stanford University Hospital, fellow in medicine. January to July 1947.

Stanford University Hospital, resident in radiology from July 1947 to July 1948.

San Francisco County Hospital, senior resident in radiology from July 1948 to July 1949.

American Board of Radiology certification October 1949.

Stanford University School of Medicine, Instructor in radiology and anatomy 1952 to the present time.

Serving on the Staffs of Palo Alto Stanford Hospital, Sequoia Hospital, El Camino Hospital and Santa Clara County Hospital.

CHARLES E. DUISENBERG (Cont'd)

Palo Alto Medical Clinic, diagnostic and therapeutic radiology, 1949 to 1957.

Private practice of radiology, 1957 to present time.

Consultant, Sunnyvale Medical Clinic

Consultant, Glycer Medical Group

Consultant, Lockheed Missile and Space Agency, Medical Division, 1959 to present.

Consultant and Medical Safety Officer, Advanced Technology Laboratories, 1961 to present.

PROFESSIONAL ACTIVITIES

American College of Radiology

Radiological Society of North America

American Medical Association

California Medical Society

Santa Clara County Medical Society

Diplomat American Board of Radiology

Society of Motion Picture and Television Engineers

Director and Research Worker at W. B. Snook Manufacturing Company Inc., since 1948

Vice President, W. B. Snook Manufacturing Company Inc., since 1964.